

REMARKS

Reconsideration of the first Office action issued in connection with the above-identified patent application is requested in view of the foregoing amendments and the following remarks. Prior to entry of the above amendments, claims 1-62 were pending and stand rejected. By the above amendments, claims 15, 18-19, 32-33 and 59-62 are cancelled without prejudice, claims 1, 20, 34, 38, and 56 are amended, and new claims 63-71 are added.

Original claims 1-62 stand rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,616,642 to West. As set forth in the Office action, West is cited for disclosing or rendering obvious the subject matter recited in each of the original claims. Applicant respectfully traverses the rejections. In view of certain commercial developments, Applicant has amended the originally pending claims. However, and for the purpose of completeness, Applicant will provide the following discussion of why the presently pending claims patentably distinguish West. As the original independent claims have been amended, the following discussion will explain not only how the amended claims are not anticipated by West, but also why the claims are not obvious over West. For the Examiner's convenience in view of the number of pending claims, Applicant will discuss each of the pending independent claims first, followed by a less involved discussion of the claims that depend therefrom. Applicant reserves the right to resume prosecution of the originally pending claims in a related application.

Amended claim 1 is reproduced below.

1. (currently amended) A firearms cartridge, comprising:
a casing;
a primer;
a propellant; and
at least one projectile having a density of at least 10 g/cc,
wherein the projectile is formed by compressing a powder-form
composition of matter that includes a tungsten-containing powder
and a binder that includes a metallic binder component and a non-
metallic binder component, wherein the metallic binder component
includes at least 50 wt% tin, and further wherein the non-metallic
binder component comprises 0.25 to 3 wt% of the powder-form
composition of matter.

As recited above, amended claim 1 is directed to a firearms cartridge that includes, amongst constituent elements of a firearms cartridge, at least one projectile that is formed by compressing a powder-form composition of matter that includes a tungsten-containing powder and a binder that includes a metallic binder component and a non-metallic binder component. In addition, amended claim 1 recites that the metallic binder component includes at least 50 wt% tin and that the non-metallic binder component comprises 0.25 to 3 wt% of the powder-form composition of matter. Therefore, according to amended claim 1, the at least one projectile not only contains tungsten, but also a metallic binder component with at least 50 wt% tin and less than 3 wt% of a non-metallic binder component.

Applicant recognizes that West contains certain similarities to the present disclosure and the pending claims. For example, West is directed to lead-substitute firearms projectiles. West further discloses that the projectiles may include tungsten and that a polymer may be used as a binder. However, West

specifically requires that this polymer includes a polyester resin and an ionomer resin. Furthermore, West is specifically directed to a extrusion process in which sufficient quantities of polymers are used to form a plastic matrix into which metal powder is dispersed and then the resulting plastic mass is extruded, pelletized and then injection molded.

On a more specific level, the disclosure of West specifically requires that the polyester and ionomer resins constitute at least 7-9 wt% of the projectiles. For example, on page 3, lines 58-62, West discloses that the maximum amount of metal powder is 93 wt%, with the rest of the projectiles being formed from a polyester matrix with a small amount of ionomer. Therefore, West fails to disclose or suggest a projectile containing no more than 3 wt% of non-metallic binder. Furthermore, West's requirement for dispersing the metal powder in a plastic matrix to permit extrusion and injection molding of the projectiles teaches away from decreasing the disclosed 7-9 wt% of non-metallic binders to 3 wt%, or less.

West also fails to provide any disclosure regarding the use of a metallic binder, much less a metallic binder that includes at least 50 wt% tin. As indicated by the Examiner in the first Office action, Applicant recognizes that West discloses that bronze powder may be used and that bronze contains tin. However, bronze is an alloy that contains a minority amount of tin, typically, 15-20 wt%, with Applicant not being aware of bronze that contains more than

25 wt% tin. Upon request, Applicant can provide references that demonstrate that bronze contains less than approximately 25 wt% tin. Accordingly, West fails to contain any specific disclosure relating to a metallic binder, much less a metallic binder that contains at least 50 wt% tin. Although West discloses that bronze may be the metallic powder used in the projectile, Applicant submits that West's reliance upon a plastic matrix to enclose the powder and West's specific disclosure of forming projectiles through an injection molding process both teach away from needing a metallic binder, much less the recited metallic binder. For at least the above reasons, Applicant submits that West fails to disclose or suggest the subject matter recited in amended claim 1. Accordingly, Applicant requests that the rejection of amended claim 1 be withdrawn.

Amended claim 38 is reproduced below for the Examiner's convenience.

38. (currently amended) A method for manufacturing a medium-density article, the method comprising:

mixing a tungsten-containing powder with a binder powder to form a powder-form composition of matter, wherein the binder powder includes a metallic binder component and a non-metallic binder component, ~~and optionally a lubricant,~~ and further wherein the metallic binder component forms at least 10 wt% of the powder-form composition of matter and the non-metallic binder component forms no more than 3 wt% of the powder-form composition of matter;

placing the powder-form composition of matter into a die;
and

compressing the powder-form composition of matter to produce an article having a density of at least 8 g/cc.

Amended claim 38 is directed to a method for manufacturing tungsten-containing articles via powder metallurgy, and more particularly, by compacting a powder-form composition of matter in a die. Amongst other subject matter, amended claim 38 recites that the method includes mixing tungsten-containing powder with a metallic binder component that forms at least 10 wt% of a powder-form composition of matter and a non-metallic binder component that forms no more than 3 wt% of the composition of matter. The method further recites that the powder-form composition is placed in a die and compressed to produce an article having a density of at least 8 g/cc.

As discussed above, West discloses and is specifically directed to a method for producing lead-free firearms ammunition through an injection molding process from a powder that is dispersed in a matrix of polyester and ionomer resins. Applicant recognizes that pressure is applied during an injection molding process; however, injection molding a plasticized composition from extruded pellets is distinctly different than compressing a powder-form composition of matter in a die. Furthermore, West fails to disclose or suggest any form of metallic binder and specifically discloses polymeric binders that are present in twice or three times the maximum amount recited in amended claim 38. It follows then that West fails to disclose or suggest the method recited in amended claim 38, in which a powder-form composition that includes metallic and non-metallic binders is compressed in a die to form a compacted article. Applicant further

submits that the other references of record also fail to disclose or suggest forming a tungsten-containing projectile or other article via powder metallurgy with both metallic and non-metallic binder components, much less the components recited in amended claim 38.

New claim 68 is reproduced below for the Examiner's convenience and is directed to an unsintered firearms projectile.

68. (new) An unsintered, frangible firearms projectile, comprising:

at least 60 wt% of a tungsten-containing component that consists essentially of at least one of tungsten, a tungsten-containing compound, a tungsten-containing alloy, and mixtures thereof;

less than approximately 30 wt% of a binder, wherein the binder comprises at least 70 wt% tin, wherein the binder further comprises a flexible heat-curable epoxy that forms at least 0.25 wt% of the projectile; and

wherein the projectile has a density of at least 10 g/cc.

Claim 68 recites, amongst other subject matter, that the projectile comprises at least 60 wt% of a tungsten-containing component that consists essentially of at least one of tungsten, a tungsten-containing compound, a tungsten-containing alloy, and mixtures thereof, and less than approximately 30 wt% of a binder. Applicant recognizes that West also discloses the use of tungsten and tungsten alloys within the recited range, and that West also discloses binders that are present as less than 30 wt % of the projectile. However, claim 68 further recites that the binder comprises at least 70 wt% tin and at least 0.25 wt% of a flexible heat-curable epoxy. West fails to disclose or suggest either of these binder components, much less the recited weight percentages of these components.

For example, the only tin that West discloses is bronze. However, bronze is neither disclosed nor suggested as a suitable binder. Furthermore, with bronze containing approximately 25% tin, or less, it is not possible for bronze to be a metallic binder component that includes at least 70 wt% tin. Regarding the other recited binder component, West fails to disclose or suggest the use of any flexible epoxies, such as the rebar epoxies disclosed in the specification, amongst others. It follows then that although there are certain similarities between portions of claim 68 and the disclosure of West, it also must be recognized that West fails to disclose or suggest other recited subject matter of claim 68. In fact, and as discussed in more detail herein, West also specifically teaches away from some of the recited subject matter. For at least the above reasons, Applicant submits that claim 68 is neither anticipated nor rendered obvious by West or the other references of record.

Claims 2-14, 16-17, 20-31, 34-37, 39-58, 63-67 and 68-71 depend directly or indirectly from the above-discussed independent claims. Accordingly, these claims should be allowed when the independent claims from which they depend are allowed. For at least the reasons expressed above, Applicant submits that the pending independent claims patentably distinguish West and the other references of record. In view of the detail already provided regarding the various reasons why each of the independent claims are believed to be allowable, each of the dependent claims will not be separately discussed and each additional reason

why each of the dependent claims patentably distinguishes West will not be discussed. However, Applicant does want to briefly discuss selected ones of the dependent claims and to present illustrative additional reasons why these claims should be allowed.

Claim 20 depends from claim 1 and further recites that the metallic binder component includes at least 70 wt% tin. As discussed above with respect to claim 68, the only tin disclosed in West is bronze, which typically contains less than one third of this amount of tin and for which there is no disclosure in West to use as a binder.

Claims 24 and 27 depend from claim 1 and respectfully recite that the non-metallic binder component includes a water-actuated polymer and an epoxy. Regarding claim 24, West's high-temperature injection molding process simply fails to disclose and teaches away from the use of a water-actuated polymeric binder, much less such a binder in combination with the other recited subject matter. Regarding claim 27, West does not disclose or suggest the use of up to 3 wt% of an epoxy as a non-metallic binder component, much less the use of flexible epoxy (claim 28), rigid epoxy (claim 29) or a combination of both flexible and rigid epoxies (claim 30). For at least these additional reasons, claims 24 and 27-30 are believed to patentably distinguish West and the other references of record. Claim 42 depends from claim 38 and recites the use of a water-actuated

polymer, which as discussed above with respect to claim 24, is neither disclosed nor suggested in West.

Claim 34 depends from claim 1 and recites that the non-metallic binder component comprises less than 1 wt% of the projectile. As discussed above, West requires at least 7 wt% of polymer to form the resin matrix in which the metallic powder is dispersed. Therefore, it follows that West fails to disclose and teaches away from the subject matter recited in claim 34.

Claim 49 depends from claim 38 and further recites that the method includes placing the powder-form composition of matter into a jacket before compressing the composition of matter. As West discloses an injection molding process that does not utilize a powder-form composition of matter, the binders recited in claim 38 or a jacket, it follows that West fails to disclose the method of claim 49.

Claim 53 recites a radiation shield formed from the tungsten-containing powder-form composition of matter, with radiation shields being nowhere disclosed or suggested in West.

Amended claim 56 depends from claim 38 and further recites that the metallic binder component consists essentially of tin and that the method includes heating the composition of matter to a temperature that is less than the melting point of the metallic binder component. In contrast, West discloses only an injection molding process in which the pellets formed from a powder-

containing resin matrix are melted at 550-570° F, a temperature that is well above the melting point of tin. For at least this additional reason, amended claim 56 is believed to patentably distinguish the references of record and to thereby be allowable. New claims 64 and 65 should be allowable for analogous reasons.

New claim 66 recites that the non-metallic binder component includes a flexible heat-curable epoxy. New Claim 66 should be allowable for at least the reasons discussed above with respect to claim 68 with respect to flexible epoxies.

New claim 67 recites that the non-metallic binder component forms 0.25-1 wt% of the powder-form composition of matter. As West requires substantially more non-metallic binder than is recited in claim 67, it follows that West fails to disclose and teaches away from the subject matter of new claim 67.

With the entry of the above amendments, and for the reasons discussed herein, Applicant submits that all of the issues raised in the first Office action have been addressed and overcome. If there are any remaining issues or if the Examiner has any questions, Applicant's undersigned attorney may be reached at the number listed below. Similarly, if the Examiner believes that a telephone interview may be productive in advancing prosecution of the present application,

the Examiner is invited to contact Applicant's undersigned attorney at the number listed below.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "David S. D'Ascenzo", is written over a horizontal line.

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